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ABSTRACT

Today it is generally acknowledged that the ongoing success of college-level courses in critical thinking is largely a response reflex. There has been a steady deterioration in the quality of communications skills offered by secondary students seeking collegiate-level schooling. These deficiencies reflect serious deficiencies in the basic thinking skills identified with communications expertise. A study by Pascarella (1987) concludes that "the freshman year at college significantly enhances the critical thinking of individuals." Research suggests that gains are made over the course of collegiate educational exposure. Other findings suggest that: critical thinking is a composite of attitudes, knowledge, and skills; the Watson-Glaser Critical Thinking Appraisal instrument seeks to provide an estimate of an individual's standing in this composite of abilities by means of five subtests designed to tap somewhat differing aspects of the composite; and results from a study of graduates of a two-year college for women show the 2-year attendance is related to a substantial improvement in critical thinking. Teaching critical thinking according to Agnew's 1986 plan and Logan's 1987 plan is discussed. It is recommended that college students be required to successfully complete critical thinking courses because all educated people need to have such skills. Contains 9 references. (SM)

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CRITICAL THINKING: THE FLAGSHIP OF THINKING SKILLS?

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> "I am not opposed to the development of critical thinking and informal logic courses. I believe they are a valuable addition to the curricul and would like to see the demonstration of the proficiency in these areas as a requirement for the granting of any undergraduate degree." (Pecorino, 1986:p.5)

Without such a requirement, many a graduate is, in reality, an 'educated' graduate flawed in reasoning. Such individuals are unable to reason clearly and logically, for they have failed to learn, understand, and apply, the technical skills involved in critical thinking; i.e., identifying premises, assumptions, conclusions, ambiguous terms, , fallacies, counterarguments, etc.

Today it is generally acknowledged that the on-going success of college-level courses in critical thinking is in large measure a 'response-reflex'. It is common knowledge that there has been a steady deterioration in the quality of communications skills offered by secondary students seeking collegiate-level schooling.

These grave deficiencies reflect, in turn, serious deficiencies in the basic thinking skills identified with communications expertise. As Pecorino (1986) notes:

> "the development and remediation of these skills has become an undeniable part of the agenda, overt or covert, of almost every institution of higher learning on the American continent." (p.7)

Additionally, as Pascarella (1987) has pointed out:

> "a major aim of American higher education has been to enhance one's ability to think critically, to reason and to evaluate and weigh evidence judiciously in making decisions and choices among alternate courses of action. ....This cluster of intellectual skills has often been labeled 'critical thinking ability', and it has equally as often been identified as one of the major outcomes of higher education." (pp 5,6)

In addition, the National Institute of Education (1984), and as MacMillan (1986) points out, the Association of American Colleges, both issued reports on the quality and character of American education. Each of these "... stressed the fostering of one's ability tothink critically as one of the indispensable impacts of an undergraduate education." (Pascarella, 1987:p.6)

Specifically - to evaluate the magnitude of the first year of college

upon the development of critical thinking ability, Pascarella (1987) conducted an assessment study. He compared matched groups of college and non-college students on changes in critical thinking over a one-year period. Using the Watson-Glaser Critical Thinking Appraisal instrument (Form A), he found that students with one year of college had significantly higher total critical thinking scores, as well as significantly higher scores in the (1) interpretation, and (2) evaluation of arguments sub-scales of the Watson-Glaser instrument.

Pascarella further notes that the advantages accruing to college attendance appeared to be the same for all students. Irrespective of individual differences in gender, race and secondary schooling levels of critical thinking, aptitude, grades, socio-economic status, and aspirations - these effects appeared to be the same. In addition, he reports that a composite measure of intellectual and social involvment during the freshman year did have positive partial correlations with critical thinking.

Pascarella (1987) concludes that the:

> "finding are encouraging in that they suggest that the freshman year at college significantly enhances the critical thinking of individuals over and above the gains which could be typically expected had these same individuals decided not to attend college the first year after high school graduation. (However) ...the findings are somewhat more sobering in that they suggest that the unique or net influence of the freshman year is modest." (pp 17,18)

In contrast to this freshman year "modest" influence, the cumulative effects of two or four years of college, in comparison with invidiauls having no collegiate schooling, may well be substantially greater. Recent-past research suggests, quite consistently, that gains are made over the course of collegiate educational exposure. Such gains are in contrast to the flattened-out growth curves of those terminating their formal schooling upon high school graduation. (Resta & Thoma, 1985).

Pascarella's study (1987) concludes that a student's level of intel lectual and social/interpersonal involvment in college may be:

> "a potentially important influence on the development of critical thinking. ....It is the student's total engagement in the intellectual and socialexperiences of college which enhances the development of critical thinking ability. This reinforces the notion that intellectual or cognitive development in college may be the result of an integrated total experience rather than the outcome of involvement in specific, limited experiences. In terms of college influence on critical thinking, the whole may indeed be greater than tthe sum of the parts." (p.21)

Adding a bit of historical perspective to this discussion, the author in 1972, as Director of Research at Harcum Junior College - a two-year college for women located in Brwn Mawr, Pennsylvania, issued an in-house Institutional Research Report (IRR). This report, which appears quite germane to this discussion of critical thinking is quoted below in its entirety (very slightly edited): (Blai, 1972)

"Office of Research
IRR 72-17

Harcum Helps Close Critical Thinking 'Gap'

1. "The abilityto think critically has long been recognized as a desireable objective. Several experimental studies, carried out at the elementary, and college levels, demonstrate that critical thinking can at least be improved as a result of training directed to this end." (Watson-Glaser,1964:p.12)

2. As viewed by Watson & Glaser (1964), critical thinking is "... a composite ofattitudes, knowledge and skills. This composite includes: (1)attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what isasserted to be true; (2) knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined; and (3) skills in employing and applying the above attitudes and knowledge." (p.10)

3. The Watson-Glaser Critical Thinking Appraisal instrument seeks to provide an estimate of an individual's standing in this composite of abilities by means of five sub-tests designed to tap somewhat differing

aspectsof the composite. "These include:

Inferencesamples ability to discriminate among degrees of truth or falsity of inference drawn from given data.

Recognition of Assumptions: Samples abilities to recognize unstated assumptions or presuppositions which are taken for granted in given statements or assertions.

Deduction: Samples ability to reason deductively from given statements or premises; to recognize the relation of implications between propositions to determine whether what may seem to be an implication or a necessary inference from given premises is indeed such.

Interpretation: Samples ability to weigh evidence and to distinguish between (a) generalizations from given datathat are not warranted beyond a reasonable doubt, and (b) generalizations which, although not absolutely certain or necessary, do seem to be warrented beyond a reasonable doubt.

Evaluation of Arguments: Samples ability to distinguish between arguments which are strong and relevant and those which are weak or irelevant to a particular question at issue. " (Watson-Glaser, 1964: p.14)

4. Watson-Glaser (1984) also note that "... correlations between raw scores on the Critical Thinking Appraisal and various verbal intelligence measures are (reflected in) ...coefficients ranging from .55 to .75 with a median of .68.... evidence of the substantial relationship existing between critical thinking ability as measured by the Critical Thinking Appraisal and mental ability measured by conventional intelligence tests. It appears, therefore that a high level of 'intelligence' as measured by conventional tests may be necessary, but not sufficient for high attainment in critical thinking." (p.10) It is further noted thatwith a median Coefficient of Determination (r^2) of .4624,

almost 50% of the variation between the variables of 'critical thinking' and intelligence are presumed to be associated with these two criterion variables.

5. In an effort to determine the extent, if any, of change in critical thinking associated with Harcum attendance, from among the freshman class of September 1970, a random sample of 60 were posttested just prior to Harcum graduation, by a second administration of the Watson-Glaser Critical Thinking Appraisal instrument; (all freshmen are pre-tested during Orientation Week with this instrument and several other tests and inventories). The results of this pre-and-post testing include the following :

N = 60

(1) Average pre-test percentile rank = 17

(2) Average post-test percentile rank = 47

Difference = 30

(3) Range of pre-and-posttest differences = (-9 thru 76)

6. In comparison with a normative group of 5,297 college freshmen, a commonly used five-level of classification of percentile ranges considers the pre-test average for the Harcum sample to be "Level IV: Low (8-31)", and the posttest average of 47 to be "Level III: Average (32-69)". To determine if the obtained difference between the means of the pre-and-post testings is likely to be a chance one or statistically significant, the "t-ratio" test was applied to the data, the result being:

$$t = \frac{30}{3.9} \text{ or } 7.4$$

7. Since a t-ratio of 3 is a virtual certainty (99.87 chances out of 100) thata true difference in means exists, one larger than 3 is that much more assurance of a statistically significant difference; i.e., one extremely unlikely to have occurred by 'chance' or sampling fluctuation alone. It is therefore with a very high level of confidencethat it is concluded the 30 percentile difference in average performance is not a 'sport' variation, but rather reflects a real difference.

8. For this sample of 60 Harcum 1972 graduates, their two-year Harcum attendance is associated with a substantial improvement in their 'critical thinking' as measured by the Watson-Glaser Critical Thinking Appraisal instrument. Ittherefore appears entirely reasonable to conclude, as the title of this report suggests - Harcum does help to close the "gap" in critical thinking - a desirable educational objective." (pp 1,2)

Teaching Critical Thinking

Among the array of pedagogical tools and techniques , two are discussed in the following paragraphs; Agnew (1986) at Saddleback College, California noting:

> "In teaching philosophy and informal logic classes, I found that I was able to teach students the technical skills involved in critical thinking, which includes identifying premises, assumptions, conclusions, ambiguous terms, fallacies, counterarguments and so on. When I asked students to critically evaluate a paragraph or an essay, they were unable to integrate all of the critical thinking skills in the overall task of evaluating the paragraph or essay." (p.3)

Agnew (1986) therefore developed, as a pedagogical aid, a Critical Thinking Worksheet, utilizing it for beginning students of philosophy and informal logic classes. Using a handout document she:

1) introduced such essential terms as "arguments", "conclusions" and "reasons or premises".

2) she next required the students, with reference to a brief written paragraph, to identify the premises and the conclusions.

3) next she guides their discussion through the steps in the process of critical thinking, covering ambiguous terms, the truth of the premises, the strength of the argument, the use of emotive tone,the fallacies in the argument, counterarguments, a summary assessment, additional information needed, counter response to/arguments, and the student's own views.

Additional handouts furnished provide students with assistance in verifying the truth or falsity of the premises of an argument and identifying

kinds of fallacies; e.g.,

1- hasty generalizations

2- false issues

3- argument resting solely upon the strength of an authority

4- arguments against the person making the claim rather than the claim itself

5- appeals to emotions

After using the worksheet, the students are asked to write on a new topic and provide their own examples. Agnew (1986) concludes;

> "The results I have received are nothing shortof astonishing; thoughtful and reflective essays on a variety of topics. The radical improvement in the student's papers can be illustrated with this fact: prior to the use of the worksheet, about 60% of the students would write an essay which consisted of an exegesis of a particular philosopher's view and would not make critical comments at all; only 40% of the students made critical comments of any kind, and fewer than 10% of the students specified their own view. Since I introduced the worksheet into philosophy classes, 100% of the students include critical evaluations in their essays, and they all express their own views, with varying degrees of skill in the evaluation and support of their own view." (p.13)

A second useful instructional technique is noted by Logan (1987) at Santa Monica College, California. She has utilized it for about a decade in a year-long, lower-dividion biology course. As Logan (1987) notes:

> "The general plan is to identify and clearly define critical thinking skills for students, model them, and give students frequent feedback by describing what they are doing and evaluating it. For instance, the teacher can help students distinguish between CLARIFICATION of the hypothesis and ANALYSIS of it." (p.3)

Logan (1987) further notes that in her discussion she considers:

1- the link between the critical thinking and scientific processes.

2- the individual critical thinking skills described in the course; i,e,, description and definition, application, deduction and inference, and induction.

3- and focuses on the use of the scientific process to teach critical thinking, defining and providing examples relating to scientific hypotheses

and conclusions, data analysis, the interpretation of results, and the construction and the evaluation of models of the phenomenon under study.

examines ways in which critical thinking can be fostered by exams, citing examples of both essay and objective questions, and

5- explores the role of the teacher in developing critical thinking.

As Logan points out:

> "The scientific process is a method for evaluating observations and experiences in the world in order to discover underlying principles that govern nature. It is a strong-sense critical thinking since the practitioners must ask such questions as
> - Is the evidence sufficient to allow this conclusion?
> - is this the only conclusion that this evidence supports?
> - is the evidence reproducible and reliable? ....
>
> The scientific process is used to teach critical thinking in a REDUCTIONIST approach because
> (1) the isolation of single steps in reasoning and
> (2) the emphasis on using only measurable techniques
>
> seem to provide fairly unambiguous examples of reasoning." (pp 3 & 5)

Logan (1987) also carefully indicates that the specific assignments described and discussed are not necessarily appropriate for all kinds of classes. She concludes, however, that "...the general concepts should be useful, and it should be possible to tailor assignments to different levels and intents using these models for ideas." (p.3)

Conclusion

Should college students be required to successfully complete critical thinking courses? Pecorino's response, which I strongly support, is:

> "Yes, by all means and for all students , because all educated people , and certainly all those who are awarded degrees in higher education out to have such skills." (p.14)

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